

# Notice of Allowability

Application No.

10/084,019

Examiner

Venkatesh Haliyur

Applicant(s)

TIEDEMANN ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 08/10/2007.
2. ☒ The allowed claim(s) is/are 8-19.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

***Allowable Subject Matter***

1. The following is an examiner's statement of reasons for allowance:

Claims 8-19 are allowed over prior art. Claims 1-7 are canceled.

The prior art of record fails to teach and render obvious the limitations as in independent claims 8,11-13,15-16,18 and dependent claims 9-10, 14,17,19 of the present invention in the instant application, which relates to wireless communication system for providing channel quality feedback in a wireless communication systems such as WCDMA specified by Third Generation Partnership Project, 3GPP; voice and data systems, such as specified by Third Generation Partnership Project Two, 3GPP2.

A previously released patent (US Pat: 6,985,453) from the same assignee was examined for the purposes of double patenting. However, in the instant application the functionality of transmitting the differential indicators independently of transmitting a quality message is not claimed in the patent, US Pat: 6,985,453. A new search was performed with new search strategies. New references have been cited in form 1449.

In a spread-spectrum wireless communication system, such as a cdma2000 system, multiple users transmit to a transceiver, often a base station, in the same bandwidth at the same time. The base station may be any data device that communicates through a wireless channel or through a wired

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channel, for example using fiber optic or coaxial cables. A user may be any of a variety of mobile and/or stationary devices including but not limited to a PC card, a compact flash, an external or internal modem, or a wireless or a wireline phone. A user is also referred to as a remote station. As the amount of data transmitted and the number of transmissions increase, the limited bandwidth available for radio transmissions becomes a critical resource. There is a need, therefore, for an efficient and accurate method of transmitting information in a communication system that optimizes use of available bandwidth.

As each user transmits to and receives from the base station, other users are concurrently communicating with the base station. Each user's transmissions on the Forward Link (FL) and/or the Reverse Link (RL) introduce interference to other users. To overcome interference in the received signals, a demodulator seeks to maintain a sufficient ratio of bit energy to interference power spectral density,  $E_b/N_0$ , in order to demodulate the signal at an acceptable probability of error. Power Control (PC), is a process that adjusts the transmitter power of one or both of the Forward Link, and the Reverse Link, to satisfy a given error criteria. Ideally, the power control process adjusts the transmitter power(s) to achieve at least the minimum required  $E_b/N_0$  at the designated receiver. Still further, it is desirable that no transmitter uses more than the minimum  $E_b/N_0$ . This ensures that any benefit to one user achieved through the power control process is not at the unnecessary expense of any other user.

Power control impacts the capacity of the system by ensuring that each transmitter only introduces a minimal amount of interference to other users and thus increases processing gain. Processing gain is the ratio of the transmission bandwidth,  $W$ , to the data rate,  $R$ . The ratio of  $E_b/N_0$  to  $W/R$  corresponds to the Signal-to-Noise Ratio, SNR. Processing gain overcomes a finite amount of interference from other users, i.e., total noise. System capacity is, therefore, proportional to processing gain and SNR. For data, feedback information is provided from the receiver to the transmitter as a link quality measure. The feedback ideally is of fast transmission with low latency. Power control allows the system to adapt to changing conditions within an environment, including but not limited to the geographical conditions and mobile velocity. As the changing conditions impact the quality of a communication link, the transmission parameters adjust to accommodate the changes. This process is referred to as link adaptation. It is desirable for link adaptation to track the condition(s) of the system as accurately and quickly as possible.

According to one embodiment, link adaptation is controlled by the quality of a communication link, wherein the SNR of the link provides a quality metric for evaluating the link. The SNR of the link may be measured as a function of Carrier-to-Interference,  $C/I$ , at the receiver. For voice communications, the quality metric  $C/I$  may be used for providing power control commands instructing the transmitter to either increase or decrease power. For packet data communications, such as an HDR system as specified in "TIA-856 cdma2000

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High Rate Packet Data Air Interface Specification," 3GPP, and 3GPP2 data communications are scheduled among multiple users, where at any given time, only one user receives data from the access network or base station. In a packet-switched data system, the quality metric measurement, such as SNR and/or C/I, may provide valuable information to the base station or access network transmitter in determining proper data rate, encoding, modulation and scheduling of data communications. Therefore, it is beneficial to provide the quality metric efficiently from the remote station to the base station.

The quality feedback message is determined by the requirements of a given system. For example, in a voice transmission system, referred to as a low-latency system, the quality message may be the measured C/I and/or a function thereof; whereas, in an HDR system, or other data transmission system, the quality message may be a Data Rate Control (DRC) indicator, wherein the DRC is provided on the reverse link as a request for a specific transmission data rate. In one embodiment, the quality message is a 5-bit indicator that is sent 800 times per second resulting in a 4000 bps rate. The total load on the reverse link for sending the 5-bit indicator is approximately that of the voice traffic channel. While the direct transmission of a quality message, such as C/I or DRC, incurs higher loading, the quality message is desirable as it provides an accurate monitor of the channel condition. Each quality message is independent and allows the transmitter to make transmission decisions without relying on historical information.

One disadvantage associated with the feedback of channel quality information is the increased transmission loading on the reverse link (or other link on which the feedback is provided). For example, the quality feedback information on the reverse link may result in reverse link loading that is approximately equal to a voice call, as the feedback information may use as much power as a voice call.

The present invention enhances the use of a quality message for providing channel quality information from the receiver to transmitter. The term quality message encompasses both a direct transmission of a quality indicator, such as a C/I value, and also, an indirect indicator, such as the power control mechanism discussed hereinabove. The quality message is selected and dynamically adjusted according to the requirements and/or operation of a given system.

Therefore the present invention for a remote station apparatus having a quality measurement unit for iteratively measuring link quality of a communication link, and a differential analyzer for determining changes in the measured link quality provides a flexible method of efficient allocation of transmission resources by reducing the transmission of feedback information used for power control and/or scheduling of data transmissions in wireless communication systems.

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Venkatesh Haliyur whose telephone number is

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571-272-8616. The examiner can normally be reached on Monday thru Friday 8:30AM to 4:30PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edan Orgad can be reached on 571-272-7884. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

3. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Venkatesh Haliyur

Patent Examiner

*OH* 10/29/07

EDAN . . ORGAD  
SUPERVISORY PATENT EXAMINER

*Edan Orgad* 10/29/07